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COMPLETE SPECIFICATION

Process for the conversion of Bituminous Substances or of Bitumen and Filler Mixtures, in particular those having a high Melting Point, into Protective Coatings on Constructions and the like by Spraying

I, GEORG COLMANT, a German citizen, of Bendorf, a.Rhein, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to a process for the spraying of bituminous masses, in particular those having a high melting point or those with a comparatively high content in fillers. As is known, such masses are used to an increasing extent in modern building practice for producing protective coatings on constructions or the like. The increasing requirements for such protective layers have brought numerous proposals in recent times for the composition of the masses in question, without, however, useful suggestions being made known at the same time for the method of application of these masses. The application of these coatings presents considerable difficulties when using masses of high consistency, which is always the case when a high efficiency is required of the protective coating with respect to insulation, strength, and the like. Thus, in particular the spraying process, which undoubtedly presents the greatest practical advantages, has had to be given up and replaced by painting or where it is practicable, the masses have been poured out. Apart, however, from the fact that these methods of working cannot be used for all the desired masses, the same strength and uniformity of the protective layers cannot be attained as is possible by the spraying process.

It has previously been proposed, to apply to surfaces molten bitumen, asphalt and pitch, in the form of a spray, by using as a source of pressure pumps, steam, or the exhaust gas from an internal combustion engine. This problem has not, however, hitherto been satisfactorily solved, since in the use of known machines particularly those employed in connection with road making, and while following the usual procedure for the spraying of similar substances, any success has been prevented owing to the constitution and the properties of the masses here under consideration.

It is, of course, known that bitumen and even bitumen having a high melting point, can be sprayed. For the spraying of bitumen with a low melting point, quite ordinary pumps, centrifugal and also piston pumps can be used. With bitumen having a high melting point, however, spraying for all practical purposes has hitherto not been possible as a complete gumming up and clogging of the pumps and the feeder devices takes place very quickly. For this reason, the use of compressed air has been adopted for the spraying out of bitumen, which for bitumen of a low melting point is easily practicable. The use of this method of working for bitumen with a high melting point, however, brings with it the great danger of spontaneous combustion of the mass taking place. Such bitumens having a high melting point must, under certain circumstances, in order to be fit for spraying, be heated to 200 to 220° C. This temperature, however, is at a dangerous level for the middle oils which must necessarily be contained in bitumen. To this must be added that the higher the melting point of the bitumen, the higher must be the pressure in order to eject the mass by spraying. The danger of spontaneous combustion is consequently very great if for a bitumen having a melting point of 35° C. for example, a compressed air pressure from 5 to 6 atmospheres is necessary.

Known spraying processes also completely fail when dealing with bitumen having a high content of fillers such as, for example, asbestos fibre, both in the case of hard bitumen and of soft bitumen. Previous efforts to spray by means of compressed air, bitumen having a high filler addition, have failed to meet with satisfactory results. Either the apparatus was soon completely blocked or the bitumen and filler separated, which again made the application of such masses by the spraying process appear to be impossible.

This invention has for its object to obviate these varied difficulties or their causes which hitherto have made the

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spraying of the masses impossible and is characterised in that the bituminous masses are placed under pressure when in the hot state by means of a mechanically acting continuous delivery pump or by means of a gas practically free from oxygen or by steam and are sprayed through a spraying nozzle having a homogenising effect with the avoidance of any sudden changes of velocity acting on the material. As shown by practical tests the causes of the above mentioned difficulties are, the influence of the compressed air or of the oxygen on bitumen masses, the pressure and movement impulses acting on the material in the pipes, and the clogging and separation phenomena thereby caused in the bitumen and filler mass. According to this invention these phenomena can now be entirely avoided if the following rules of procedure for the spraying of the masses are observed.

Primarily, the contact of compressed air with the melted mass in the pressure conveyor devices is to be avoided. Preferably this is brought about by using directly as the pressure producing means a mechanically operating continuous delivery pump. In place of such a pump, steam or if necessary superheated steam can be used as the pressure medium. In this way, the influence of the oxygen and, above all, the danger of the spontaneous combustion of the heated bitumen masses is obviated.

Furthermore in order to prevent the clogging and separation phenomena in the pressure and spraying devices, these devices are so arranged according to this invention that there is no sudden alteration of cross-section of the pipes or the like parts by means of which pressure impulses could be produced in the hot mass flowing through. The result thus attained is that the masses are carried along in a constant and uniform movement until they finally reach the spraying nozzles. If circumstances do not allow the above mentioned alterations of cross-section to be completely avoided, then by-passes, compensating spaces or like known means must be provided at the points where bends are formed in the pipes to prevent any sudden change of velocity or pressure of the material which is being conveyed through the spraying device.

Above all, when the masses to be sprayed have a high addition of fillers, it will be necessary to oppose a separation of the mixture again at the spraying nozzle which can be brought about by the use of homogenising nozzles in themselves known. It is also possible to supply compressed air at the point of exit of the mass from the nozzle, as is already the case with known devices, for the better atomisation. Even if compressed air supplied at this point does not produce the defects mentioned previously, it is nevertheless advisable to use instead of air, a neutral gas, e.g., nitrogen in order to prevent oxidation of the bitumen which would take place on the application of compressed air.

According to the present invention the use of nitrogen also comes into consideration when dealing with bitumen masses or mixtures at high temperatures and high pressure, for example, underground, in mines, and the like, where there may be inflammable gases or firedamp. In such cases nitrogen can be supplied as a safety measure to the bitumen tank from a nitrogen container, which has in the usual way a reducing valve, the container being brought into communication with this tank. Since nitrogen is almost as heavy as air and comes on to the bitumen surface in a cold expanded condition it remains for a certain time over the bitumen mass and thus blocks the entrance of oxygen, whereby the bitumen tank itself does not need to be closed. Thus no oxygen can penetrate to the bitumen and spontaneous combustion is therefore impossible. Furthermore, the bitumen vapours which are liberated by the heating cannot escape from the bitumen boiler itself and thus remain in the bitumen tank. There is consequently no distillation. Furthermore, any spark occurring in the vicinity cannot cause the ignition of the bitumen mass.

It has been found that by the correct observation of the foregoing process rules and with a suitable construction of the devices used, it is possible for example, even under the most unfavourable external temperature conditions to apply bitumen masses having additions of 50% of filler and even more in entirely uniform adhering protective layers of any desired thickness on all possible surfaces. This result means a considerable technical improvement since it is now possible to apply masses by the spraying process which were hitherto considered to be completely impossible to spray and were therefore frequently applied with considerable danger in the hot condition or the masses even had to be trowelled on when, for example, applying protective layers on ceilings. Bituminous substances of high consistency, that is of a melting point of 70° C. and over, to which many natural and artificial asphalts such as mineral pitch, petroleum residues,

hard and brown coal-tar pitch, wood tar pitch and common tars appertain, which are often mixed to a high percentage with finely ground mineral filling substances, serve as such protective layers.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Process for the production on buildings and the like, of protective layers consisting of bituminous substances in particular those of high melting point or those with a comparatively high content in fillers, characterised by these bituminous masses being placed under pressure when in the hot state by means of a mechanically acting continuous delivery pump or by means of a gas practically free from oxygen and being sprayed through a spraying nozzle having a homogenising effect with the avoidance of any sudden changes of velocity acting on the material.

2. Process according to claim 1, characterised by steam, and if necessary superheated steam, being used as the pressure medium for the melted material.

3. Process according to claims 1 and 2, characterised by the hot bituminous mass standing in a container, which may be open, being closed from the air by nitrogen carried over it.

4. Process according to claims 1—3, characterised by the use of such conveying and spraying devices as have no variations in cross-section, or only gradual ones.

5. The improved process for the conversion of bituminous substances into protective coatings by spraying substantially as described.

Dated this 16th day of December, 1935.

WHEATLEY & MACKENZIE,
40, Chancery Lane, London, W.C.2,
Agents.

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